UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
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ART UNIT	PAPER NUMBER
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NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>06 April 2010</u>.

2a) ☒ This action is **FINAL**.   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1 and 3-27</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1 and 3-27</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>4/6/2010</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments filed 3/22/2010 have been fully considered but they are

not persuasive. Applicant argues that Narasimhan does not teach detecting only noise

and interference of idle sub-carrier. However, examiner disagrees. Narasimhan

teaches determining signal to noise ratio. Signal to noise ratio (SNR) determines noise

that is encountered with respect to the signal to be used for communication. This noise

is from other idle sub-carrier frequency band which is not used for communicating

signals. In determining SNR you are determining the noise of the other idle sub-carrier

frequency band. The noise determined is the amount of noise and interference present

from other sub-carrier frequency band that is interfering with the current signal which is

to be used for communication. Therefore, by calculating SNR the noise and

interference of the idle sub-carrier band is determined.

Claim Rejections - 35 USC § 102

2.   The text of those sections of Title 35, U.S. Code not included in this action can

be found in a prior Office action.

3.   Claims 1, 3-8, 12-27 are under 35 U.S.C. 102(e) as being anticipated by

Narasimhan (USPN 7,016,651).

        Regarding claim 1, Narasimhan teaches a method of estimating noise in an

Orthogonal Frequency Division Multiplexing (OFDM) system **[Abstract]**, the method

comprising: receiving OFDM symbols **[Abstract]**; and detecting a received power in an

idle sub-carrier frequency band, wherein the idle sub-carrier frequency band includes

only noise and interference **[Abstract, determining SNR determines power of idle sub-carrier where you determine power of noise in the signal to noise ratio]**; and averaging the received power with at least one previously stored received power measurement for the idle sub-carrier frequency band **[Col. 8, lines 17-47, averaging the power over the number of OFDM symbols and measuring signal quality and performing SNR estimate and averaging on a per symbol basis]**.

Regarding claim 3, Narasimhan teaches prior to detecting the received power, demodulating an idle sub-carrier corresponding to the idle sub-carrier frequency band **[Fig. 2, 220 is before 235, also see Col. 5, lines 61-67 – Col. 6, lines 1-8]**.

Regarding claim 4, Narasimhan teaches determining the idle sub-carrier frequency band based in part on a received message **[Col. 12, lines 20-26, where selecting one of the subsets will leave the other subset idle]**.

Regarding claim 5, Narasimhan teaches the idle sub-carrier frequency band based in part on an internally generated sequence **[Col. 12, lines 20-26, selection is done after FFT recovers the symbols]**.

Regarding claim 6, Narasimhan teaches wirelessly receiving, from a base station transmitter, RF OFDM symbols **[Fig. 1, Col. 3, lines 19-23]**.

Regarding claim 7, Narasimhan teaches converting wirelessly received RF OFDM symbols to baseband OFDM symbols **[Fig. 1, 120]**; removing a guard interval from the baseband OFDM symbols **[Col. 3, lines 35-40]**; and transforming, using a Fast Fourier Transform (FFT), time domain OFDM baseband signals to modulated sub-carriers **[Fig. 2, 208]**.

   Regarding claims 8, 20, 26, Narasimhan teaches determining **one of a**
magnitude, amplitude, or **a squared magnitude** in the idle sub-carrier frequency band
[Col. 8, lines 57-64].

   Regarding claim 12, Narasimhan teaches averaging the received power with at
least one previously stored received power measurement to produce a noise estimate
corresponding to the idle sub-carrier frequency band **[Fig. 4, 410-420, Col. 10, lines
19-31]**; and communicating the noise estimate to a transmitter **[Fig. 4, 435, 440]**.

   Regarding claim 13, Narasimhan teaches transmitting the noise estimate from a
terminal transmitter to a base transceiver station **[Fig. 1, noise estimation is done in
120 which is then passed to 135, Col. 3, lines 40-48]**.

   Regarding claim 14, Narasimhan teaches a method of estimating noise in an
Orthogonal Frequency Division Multiplexing (OFDM) system **[Abstract]**, the method
comprising: receiving OFDM symbols in a wireless cellular communication system, the
OFDM symbols corresponding to a symbol period **[Abstract]**; determining an idle sub-
carrier frequency during the symbol period **[Col. 12, lines 20-26, where selecting one
of the subsets will leave the other subset idle]**, wherein the idle sub-carrier
frequency band includes only noise and interference **[Abstract, determining SNR
determines power of idle sub-carrier where you determine power of noise in the
signal to noise ratio]**; determining a power, during the symbol period, in a frequency
band corresponding to the idle sub-carrier frequency band **[Abstract, determining
SNR determines power of idle sub-carrier]**; storing a value of the power of the idle
sub-carrier frequency band in a memory; and averaging the power of the idle sub-carrier

frequency band with previously stored values to generate a noise estimate **[Col. 8,
lines 17-47, averaging the power over the number of OFDM symbols and
measuring signal quality and performing SNR estimate and averaging on a per
symbol basis]**.

      Regarding claim 15, Narasimhan teaches an apparatus for estimating noise in
an Orthogonal Frequency Division Multiplexing (OFDM) system **[Fig. 2]**, the apparatus
comprising: a wireless receiver configured to wirelessly receive OFDM symbols
corresponding to an OFDM symbol period **[Fig. 1 and 2, 120]**; a detector configured to
detect a received power level received by the wireless receiver during the OFDM
symbol period **[Fig. 2, 210, 235]**; a processor coupled to the detector and configured to
determine an idle sub-carrier frequency band during the OFDM symbol period wherein
the idle sub-carrier frequency band includes only noise and interference **[Abstract,
determining SNR determines power of idle sub-carrier where you determine
power of noise in the signal to noise ratio]**, to determine a noise estimate based in
part on a received power level in the idle sub-carrier frequency band **[Fig. 4, 415, Col.
3, lines 31-48, determining SNR determines power of idle sub-carrier]**, and to
determine an average noise estimate based in part on the noise estimate and a
previously stored noised estimate **[Col. 8, lines 17-47, averaging the power over the
number of OFDM symbols and measuring signal quality and performing SNR
estimate and averaging on a per symbol basis]**.

      Regarding claims 16 and 22, Narasimhan teaches the apparatus comprising
memory coupled to the processor to store the noise estimates in the memory **[Fig. 4,**

420 step shows comparing SQ which is noise estimate from step 415 so the

apparatus has to have memory coupled to processor, also see Col. 10, lines 8-34].

     Regarding claims 17 and 23, Narasimhan teaches the apparatus comprising a

memory coupled to the processor and storing a predetermined number of previously

determined noise estimates corresponding to the idle sub-carrier frequency band, the

processor determining an average noise estimate based in part on the noise estimate

and the previously determined noise estimates **[Col. 7, lines 29-42, the soft-decisions**

are noise estimates which would have to be stored if you want to get geometric

mean so the apparatus has to have memory coupled to processor, also see Col.

10, lines 8-34].

     Regarding claims 18 and 24, Narasimhan teaches the wireless receiver

comprises: an RF receiver portion configured to wirelessly receive RF OFDM symbols

and convert the RF OFDM symbols to the OFDM symbols **[Fig. 1, 120]**; a Fast Fourier

Transform (FFT) module configured to receive the OFDM symbols from the RF receiver

portion and transform the OFDM symbols to modulated sub-carriers **[Fig. 2, 208]**; and a

demodulator coupled to the FFT module and configured to demodulate the modulated

sub-carriers **[Fig. 2, 220]**.

     Regarding claims 19 and 25, Narasimhan teaches the detector detects the

received power levels of an output of the demodulator **[Fig. 2, 235]**.

     Regarding claim 21, Narasimhan teaches an apparatus for estimating noise in

an Orthogonal Frequency Division Multiplexing (OFDM) system **[Fig. 2]**, the apparatus

comprising: means for wirelessly receiving OFDM symbols corresponding to an OFDM

symbol period **[Fig. 1 and 2, 120]**; means for detecting a received power level received

by the means for wirelessly receiving OFDM symbols during the OFDM symbol period

[Fig. 2, 210, 235]; processing means, coupled to the means for detecting, for

determining an idle sub-carrier frequency band during the OFDM symbol period wherein

the idle sub-carrier frequency band includes only noise and interference **[Abstract,**

determining SNR determines power of idle sub-carrier where you determine

power of noise in the signal to noise ratio], for determining a noise estimate based in

part on a received power level in the idle sub-carrier frequency band **[Fig. 4, 415, Col.**

3, lines 31-48, determining SNR determines power of idle sub-carrier], and for

determining an average noise estimate based in part on the noise estimate and a

previously stored noised estimate **[Col. 8, lines 17-47, averaging the power over the**

number of OFDM symbols and measuring signal quality and performing SNR

estimate and averaging on a per symbol basis].

   Regarding claim 27, Narasimhan teaches a computer-readable medium

embodying a program of instructions executable by a processor to perform a method of

estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system

[Col. 10, lines 8-34], the method comprising: receiving OFDM symbols in a wireless

cellular communication system, the OFDM symbols corresponding to a symbol period

[Abstract]; determining an idle sub-carrier frequency band during the symbol period

[Col. 12, lines 20-26, where selecting one of the subsets will leave the other

subset idle], wherein the idle sub-carrier frequency band includes only noise and

interference **[Abstract, determining SNR determines power of idle sub-carrier**

where you determine power of noise in the signal to noise ratio]; determining a

power, during the symbol period, in the idle sub-carrier frequency band **[Abstract,**

determining SNR determines power of idle sub-carrier]; storing a value of the power

of the idle sub-carrier frequency band in a memory; and averaging the power of the idle

sub-carrier frequency band with previously stored values to generate a noise estimate

[Col. 8, lines 17-47, averaging the power over the number of OFDM symbols and

measuring signal quality and performing SNR estimate and averaging on a per

symbol basis].

Claim Rejections - 35 USC § 103

4.   Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Narasimhan (USPN 7,016,651) in view of Vella-Coleiro (USPN 7,197,085).

Regarding claim 9, Narasimhan teaches a method as discussed in rejection of

claim 1.

However, Narasimhan does note teach determining a sum of a square of a

quadrature component with a square of an in-phase component.

Vella-Coleiro teaches determining a sum of a square of a quadrature component

with a square of an in-phase component **[Col. 4, lines 38-45]**.

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to determine a sum of a square of a quadrature component with a

square of an in-phase component so that index value can be calculated **[Col. 4, lines**

38-45].

5.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Narasimhan (USPN 7,016,651) in view of Jones et al. (USPN 6,757,241).

Regarding claim 10, Narasimhan teaches a method as discussed in rejection of

claim 1.

However, Narasimhan does not teach determining if the idle sub-carrier

frequency band comprises a system wide idle sub-carrier frequency band; storing the

detected received power as a noise plus interference estimate if the idle sub-carrier

frequency band does not comprise the system wide idle sub-carrier frequency band;

and storing the detected received power as a noise floor estimate if the idle sub-carrier

frequency band comprises the system wide idle sub-carrier frequency band.

Jones teaches determining if the idle sub-carrier frequency band comprises a

system wide idle sub-carrier frequency band **[Col. 3, lines 35-38]**; storing the detected

received power as a noise plus interference estimate if the sub-carrier frequency band

does not comprise the system wide idle frequency band **[Col. 3, lines 49-55]**; and

storing the detected received power as a noise floor estimate if the sub-carrier

frequency band comprises the system wide idle frequency band **[Col. 4, lines 29-38]**.

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to store the detected receive power as a noise plus interference

estimate if the sub-carrier frequency is being used and only storing noise if the sub-

carrier frequency band is not used since in the absence of interference only noise is

present **[Col. 4, lines 37-38]**.

6.   Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over
Narasimhan (USPN 7,016,651) in view of Jones et al. (USPN 6,757,241) as applied to
claim 10 above, and further in view of Crawford (USPN 6,549,561).

  Regarding claim 11, the references teach a method as discussed in rejection of
claim 10.

  However, the references do not teach synchronizing a time reference with a
transmitter transmitting the OFDM symbols.

  Crawford teaches synchronizing a time reference with a transmitter transmitting
the OFDM symbols **[Col. 6, lines 1-3]**.

  It would have been obvious to one of ordinary skill in the art at the time the
invention was made to synchronize the time with a transmitter since its well known in
the art that this information is included in the short symbol portion **[Col. 6, lines 1-3]**.

Conclusion

7.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time
policy as set forth in 37 CFR 1.136(a).

  A shortened statutory period for reply to this final action is set to expire THREE
MONTHS from the mailing date of this action. In the event a first reply is filed within
TWO MONTHS of the mailing date of this final action and the advisory action is not
mailed until after the end of the THREE-MONTH shortened statutory period, then the
shortened statutory period will expire on the date the advisory action is mailed, and any
extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chandrahas Patel whose telephone number is (571)270-1211. The examiner can normally be reached on Monday through Thursday 7:30 to 17:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on 571-272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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